

exhibiting pale yellow stripes running the length of the leaf. In extreme cases, the entire plant may turn white with marginal necrosis (burn) of the leaf. In dicots, **Ni** toxicity causes an interveinal chlorosis (yellowing) that looks very similar to manganese deficiency.

Selenium (Se)

Natural Occurrence: Only a few rare minerals—crooksite and clausthalite—contain **Se**. It occurs in flue dusts remaining from the processing of copper sulfide ores. Today most of the world's **Se** comes from electrolytic copper refineries.

Uses: Essential nutrient in animal nutrition; component of dandruff shampoos and fungal infection treatments; used in manufacture of ruby-colored glasses and enamels, photoelectric cells, resistors, photographic emulsions, stainless steel, pigments, rubber, metal alloys, textiles, petroleum and medical therapeutic agents

Notes: **Se** benefits crop production and is essential to animal nutrition. Deficiency causes muscular dystrophy in livestock, known as “white muscle disease,” and loss of hair. **Se** content in food and feed crops (for livestock) ranges from 0.1–1.0 ppm. Levels above 5 ppm cause “alkali disease” or “blind staggers.” Too much **Se** also causes feather loss in poultry and malformation of livestock hooves and teeth. Although elemental **Se** is not toxic, compounds like hydrogen selenide are extremely toxic.

Se competes with sulfur in plant uptake. When toxic levels of **Se** are found in forage crops, addition of sulfur is a common remedial treatment. A sulfur rate of 15–25 lb/acre should be sufficient to reduce the toxic effect in animals. If **Se** levels are high, consult with an animal nutrition specialist and submit a forage sample for analysis.

Copper (Cu) & Zinc (Zn)

Natural Occurrence: **Cu** occurs in rocks, soil, water, air, plants and animals; **Zn** is a common element found in air, soil, water and all foods.

Uses: **Cu**—Component in metal alloys; electrical wiring; some water pipes; preservatives for wood, leather and fabrics; and some agricultural fungicides **Zn**—Widely used in industry to make dye, paint, rubber, wood preservatives and ointments

Notes: **Cu** and **Zn** are essential plant micronutrients. However, at high levels, they may be toxic to plants. They can also bind to soil organic matter and become unavailable to plants. Higher availability is usually associated with low pH.

Plants vary in their sensitivity to **Cu** and **Zn**. Based on field observation, critical toxic levels for plants that are not unusually sensitive are 60 ppm (NCDA&CS soil test Cu-I = 3000) and 120 ppm (NCDA&CS soil test Zn-I = 3000) for **Cu** and **Zn**, respectively. Peanuts are extremely sensitive to **Zn**, and toxicity has been seen at levels as low as 12 ppm (Zn-I = 300).

Nutrient management guidelines typically stipulate finding alternative waste application sites when soil levels reach 40 ppm **Cu** (Cu-I = 2000) or 80 ppm **Zn** (Zn-I = 2000), but where peanuts are grown, 20 ppm **Zn** (Zn-I = 500) is the limit. Waste applications should cease when levels reach the critical toxic level as noted above. Since **Cu** and **Zn** availability is highly dependent on soil pH, a pH of 6.0 should be maintained on mineral soils.

Homeowner Concerns

The NCDA&CS soil lab does not test soil samples from home sites where there are concerns about heavy metals. Because our analysis is conducted with Mehlich-3 soil test extractant, the data obtained may not be comparable with guidelines established by U.S. regulatory or health agencies. If health concerns do exist and soil analysis is desired for this purpose, contact a private lab and request the approved EPA tests for total metals. For a list of private labs that may be able to provide assistance, visit h2o.enr.state.nc.us/lab/nccert.htm.

Specific concerns about metals with regard to human health should be addressed to

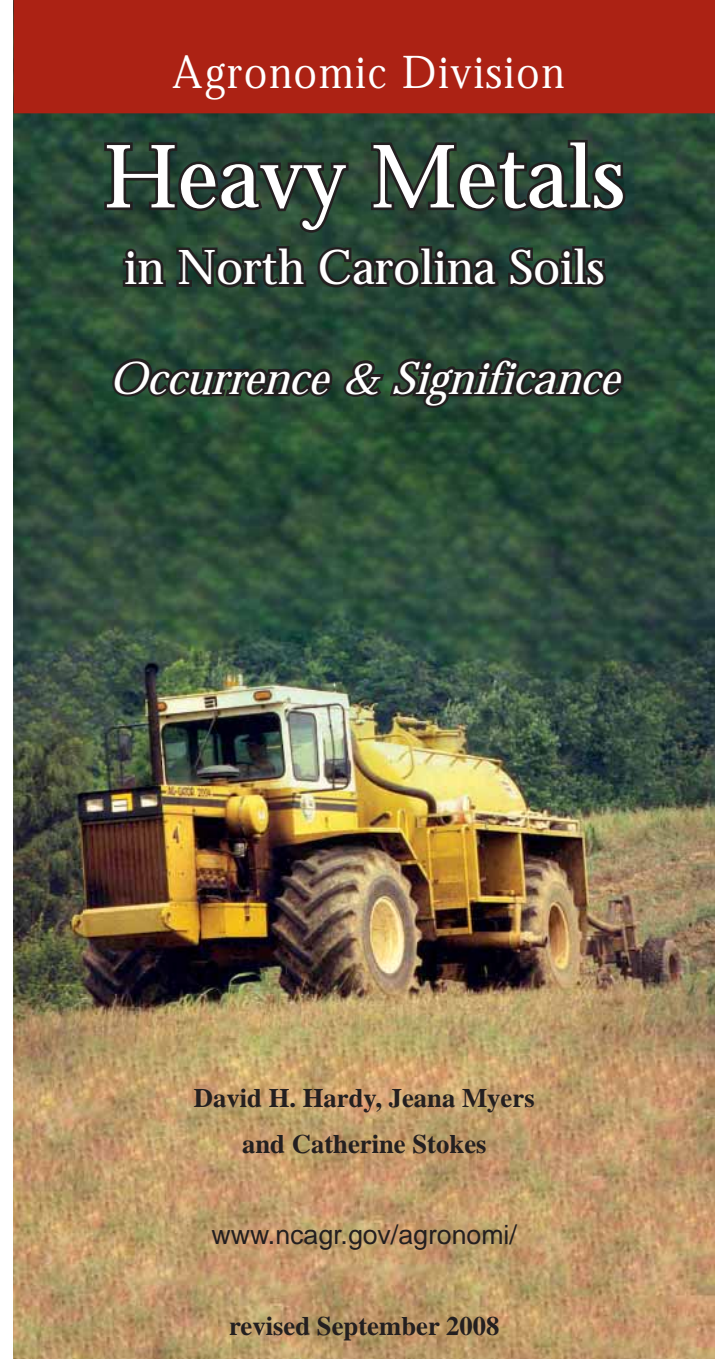
- U.S. Centers for Disease Control and Prevention —www.cdc.gov
- U.S. Environmental Protection Agency—www.epa.gov
- N.C. Public Health—www.ncpublichealth.com or
- local public health agencies.

Agronomic Division

Heavy Metals

in North Carolina Soils

Occurrence & Significance



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www.ncagr.gov/agronomi/

revised September 2008

N.C. Department of Agriculture
and Consumer Services

Steve Troxler, Commissioner